HARLAN’S HAWK differs from RED-TAILED HAWK, especially in plumages.

British Columbia

harlani

Buteo jamaicensis calurus

William S. (Bill) Clark
HARLAN’S HAWK: described as *Buteo harlani* by Audubon (1830), based on his Louisiana adult specimen.

Type specimen is in the British Museum.

Ornithological Biography i:442-443.
TAXONOMIC HISTORY

1833-1891: Species: *B. harlani*

1891-1944: Subspecies of Red-tailed Hawk: *Buteo jamaicensis harlani*, but *without taxonomic justification*. AOU 1891.


For a presentation on the lack of taxonomic justification:
Is HARLAN’S HAWK a subspecies of Red-tailed Hawk?
Review of publications that advocate such – and why their taxonomic justifications are not convincing. Go to:
http://www.globalraptors.org/grin/ResearcherResults.asp?IresID=155
And scroll down to ‘Publications’ and click on ‘pdf’ after ‘Is Harlan’s Hawk a subspecies of …’
Red-tailed Hawk subspecies and ranges

KR is Krider’s Hawk, shown to be a color morph, not a subspecies.

- HA harlani
- AL alascensis
- CA calurus
- BO borealis
- FUE fuertesi
- UM umbrinus
- HAD hadropus
- CO-KE costaricensis
- SOL solitudinus
- JA jamaicensis
- SO socorroensis
- FU fumosus

Todd (1950) described abieticola AB that occurs in taiga of north Canada and differs from borealis.

The AOU never recognized abieticola.

These ranges are not correct. See map later in the presentation.
Red-tailed Hawk subspecies and ranges

These ranges are also not correct. But do show *abieticola*. Ranges of *borealis*, *alascensis*, & *costaricensis* are better. See map later in the presentation.

Jean Iron
ROM
Plumage differences among the (other) 11 subspecies of *jamaicensis* are minor. Tails are much the same in all races.
Plumage differences among the (other) 11 subspecies of *jamaicensis* are minor.
To better understand both Harlan’s Hawks and Red-tailed Hawks, especially their plumages, I
* examined & photographed >2500 specimens in almost all major museums & many smaller.
* measured bare tarsi of 510 specimens & live hawks of these taxa taken in breeding season, either taken at the nest or during June-August.
* took photos of >500 migrating adult Harlan’s Hawks in se Alaska for ten days each in April 2008 & 2010.
* captured and examined in hand > 350 hawks & collected hundreds of photos of these taxa.
Results: Harlan’s Hawk differs from Western Red-tailed Hawk, *Buteo jamaicensis calurus*, by:

1. Frequency of color morphs;

2. Adult plumages by color morph, especially in tail pattern and color;

3. Harlan’s adult & juvenile body plumages are almost alike; whereas those of Red-tails differ.

4. Extent of bare area on the tarsus.
HYBRIDS

More than 100 museum specimens and many hawks in the wild have shown a mix of traits and are most likely hybrids.

These hybrids are not considered in this discussion of plumage differences.
Breeding Ranges

Harlan’s Hawks breed in Alaska, Yukon, nw BC, and the far north of NWT. The ranges of five (other) subspecies of Red-tails are shown.

From Wheeler 2003, with modifications
HARLAN’S HAWKS ARE & HAVE BEEN BREEDING WITHIN THE RED-TAILED HAWK RANGE IN WESTERN CANADA

For a presentation explaining the extent of overlap in breeding, go to:

http://www.globalraptors.org/grin/ResearcherResults.asp?IresID=155

And scroll down to ‘Publications’ and click on ‘pdf’ after ‘Harlan’s Hawk are & have been...’
Harlan’s Hawk differs from Red-tailed Hawk, *Buteo jamaicensis calurus*, by:

1. Frequency of color morphs;

Results are based on > 500 photos of adult *harlani* taken in Alaska and on > 500 *calurus* adult specimens in museums and in hand.
Only one of the Red-tailed Hawk subspecies in North America has a dark color morph: *B. j. calurus*

And only a small fraction (1-2%) of *calurus* are dark-morph birds. Contra *harlani*, in which the vast majority are dark morph.
Harlan’s have an intermediate morph not shown by adult Red-tailed Hawks. Overall blackish but streaked white below, always a white throat. Adult & juvenile body plumages almost the same. Juvenile rufous-morph Red-tails are similar to these juveniles, but adult rufous Red-tails differ greatly.

Aged by eye color and tail pattern.

5% Aged by eye color and tail pattern.
The taxa differ in color morph frequencies:

<table>
<thead>
<tr>
<th>Morph: dark</th>
<th>rufous</th>
<th>interm.</th>
<th>light</th>
</tr>
</thead>
<tbody>
<tr>
<td>harlani</td>
<td>85%</td>
<td>5%</td>
<td>10%</td>
</tr>
<tr>
<td>calurus</td>
<td>1-2%</td>
<td>4%</td>
<td>&gt;95%</td>
</tr>
<tr>
<td>borealis, abieticola, &amp; alascensis</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Results: Harlan’s Hawk differs from Western Red-tailed Hawk, *Buteo jamaicensis calurus*, by:

2. Adult plumages by color morph, especially in tail pattern and color;
2. Adult plumages differ: light-morph

**Harlan’s adults are black and white.**

**Red-tailed adults are rufous-brown and buffy.**

**ALL light-morph adult calurus differ from all light-morph adult harlani**
Differences between *harlani* and *calurus*

Adult Red-tails always show narrowly barred secondaries with a wide subterminal band. Adult Harlan’s often show mottled, unbarred, or lightly barred secondaries, as well as wider & often irregularly marked subterminal band.
Adult Red-tailed Hawk (specifically *calurus*) traits

They have a rufous-buff wash on the underparts and under wing coverts. Most Red-tails are light morph.

They have brown heads with wide dark brown malars and dark throats. Heads lack white streaking. Secondaries always show narrow banding.
## Comparison of adult traits

<table>
<thead>
<tr>
<th></th>
<th><em>calurus</em></th>
<th><em>harlani</em></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Adult tail</strong>:</td>
<td>Uniformly rufous narrow dark subterminal band, narrow dark bands in some adults. Little variation.</td>
<td>Highly variable, mottled or with irregular wavy banding or both. subterminal band irregular</td>
</tr>
<tr>
<td><strong>Body feathers:</strong></td>
<td>Warm brown with dark bases. Never shows white streaks on breast or head.</td>
<td>Cold blackish with white bases, showing as streaks.</td>
</tr>
</tbody>
</table>
## Comparison of adult traits

<table>
<thead>
<tr>
<th></th>
<th><em>calurus</em></th>
<th><em>harlani</em></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Throat:</strong></td>
<td>Completely dark</td>
<td>White – Light morph</td>
</tr>
<tr>
<td></td>
<td></td>
<td>White, streaked, or dark</td>
</tr>
<tr>
<td><strong>Malar:</strong></td>
<td>Wide dark brown (Light)</td>
<td>Narrow black</td>
</tr>
<tr>
<td><strong>Secondaries:</strong></td>
<td>Narrow dark bands</td>
<td>Often only dark</td>
</tr>
<tr>
<td></td>
<td></td>
<td>mottling or wavy, wide bands, also narrow</td>
</tr>
</tbody>
</table>
Traits shared by *harlani* and *calurus*

Rufous in the tail and body
Wing shape
Dark patagial marks & belly bands

These characters are not useful in distinguishing the two taxa and are not considered *calurus* traits
Dark-morph adult Harlan’s Hawks are distinguishable from adult dark-morph Red-tailed Hawks.
Dark-morph adult Harlan’s Hawks are distinguishable

85% of Harlan’s are dark  <1% of calurus are dark

Harlan’s below and dark Red-tail above
Dark adult Harlan’s Hawks with rufous breasts are distinguishable from adult rufous-morph Red-tailed Hawks.

Under tails of Harlan’s are white; those of Red-tails are pinkish.

from adult rufous-morph Red-tailed Hawks.
Liguori & Sullivan (2010) show and discuss many of these differences. They show a new field mark for some Harlan’s adults, the white tufts at the base of the wings.
Adult Harlan’s tails can either be gray or can have some rufous & vary a lot

Adult Red-tails always have all rufous tails with a narrow dark subterminal band and sometimes other narrow bands

The rufous in some harlani tails could due to ancestry or to breeding with jamaicensis
ADULT HARLAN’S HAWK TAILS

Few museum collections have enough adult specimens to show the variation

Field Museum

Royal Alberta Museum

And many tails show some rufous
Variation in the Tails of Harlan’s Hawks

John J. Audubon in 1831 described Harlan’s Hawk and sent the type specimen to the British Museum. It has been alternately considered a separate species, Varied harrier (from the 1830s to 1891), as well as from 1944 to 1973, and as a subspecies of the Red-tailed Hawk B. jamaicensis Harlan (from 1891 to 1944 and from 1973 to the present). Harlan’s Hawk breeds in Alaska (except for the coastal southwest), the Yukon Territory, extreme northeastern British Columbia, and south of the Northwest Territories, its winter range is large, including southwestern British Columbia and most of the western and central U.S. west to Illinois, and Louisiana. Throughout the winter range, Harlan’s Hawk occurs locally with and less commonly than various other subspecies of Red-tailed Hawk.

Overview of Variation in Harlan’s Hawk

Tails of adult Harlan’s Hawks are illustrated in various field guides as pale to medium gray with some dark mottling and a prominent long well-defined dark subterminal band (e.g., Peterson 1980; Robbins et al. 1983; Sibley 2000; Pruett and Alderfer 2006). Several of these guides include just one illustration, specially report guides (Wheeler and Clark 1990; Clark and Wheeler...
My presentation: EXTREME VARIATION IN ADULT HARLAN’S HAWKS’ TAILS

Available on The Peregrine Fund web site GRIN.
Go to: http://www.globalraptors.org/grin/Researcher Results.asp?id=155
And scroll down to ‘Publications’, then click on ‘pdf’ after ‘Extreme tail variation...’
Harlan’s are white, and Red-tails are pinkish.
Dark-morph adult Red-tailed Hawks tails (n = 42)

Subterminal band only:  n = 11
Faint narrow banding:  n = 11
Partial narrow banding:  n = 8
Completely banded:         n = 12

None are like all rufous Harlan’s tails harlani
RoyalBC
Harlan’s Hawk differs from Red-tailed Hawk, *Buteo jamaicensis calurus*, by:

3. Harlan’s adult & juvenile plumages are nearly alike; whereas adult and juvenile plumages of Red-tails differ.

Harlan’s adults would seem to have evolved juvenile-like plumages.
Adult and juvenile body plumages of Red-tailed Hawks differ

**Adults:** dark rufous-brown above & a buffy to rufous wash & barring below

**Juveniles:** dark brown with white bases above and white with cold brown marks below

**Light-morph**

*Washington* Adult  
*Washington* Juvenile
Adult and juvenile plumages of Red-tailed Hawks differ

**Adult**
- *B. j. calurus*
- *B. j. alascensis*

**Burke Museum**
- Adult
- Juveniles

**U of AZ**
- Adult
- Juveniles

**U. Of British Columbia**
- Adult
Adults have dark brown under wing coverts & breasts, dark feather bases.

Juveniles show white or rufous streaks due to white feather bases.
Adult Harlan’s are almost the same as juveniles in body plumage

Two of the above are adults and two are juveniles, but which are which?

Royal Ontario Museum
Adult Harlan’s are almost the same as juveniles in body plumage.
Adult Harlan’s are almost the same as juveniles in body plumage.
Harlan’s juvenile intermediate is similar to juvenile rufous Red-tails, whereas the adults of both are quite different.

Body plumage of intermediate adult and juvenile Harlan’s are nearly alike, unlike adult & juvenile rufous Red-tailed Hawks.
Harlan’s Hawk differs from Red-tailed Hawk, *Buteo jamaicensis calurus*, by:

4. Extent of bare area on the tarsus.

Feathering extends farther down the legs in *harlani*, compared to *calurus*, with almost no overlap.
I noted a difference in the length of bare area on the front of the tarsi between:

- **harlani** & **calurus**
  - Adult
  - Juvenile

Rick Morse

Washington

Juvenile

Adult

Washington

Washington

Alberta
I measured the bare area on the front of the tarsus of all taxa.

From the top of the first scute w/o feathers to the bottom of the last large scute.
Breeding season

Defined as June through August, especially in Alaska and Canada, or taken on the nest while breeding.
BARE TARSUS MEASUREMENT:

*harlani* (914): 32.0 mm

Breeding season average:

*harlani* (94): 32.1 mm

Breeding season averages:

*calurus* (218): 41.4 mm

*alascensis* (38): 37.4 mm

*borealis* (135): 38.7 mm

*fuertesi* (25): 41.8 mm
Bare Tarsus Length

Tarsus Length in mm

Orange: harlani n = 94
Blue: calurus n = 218

Breeding season only
Harlan’s Hawk breeding season measurements

- **AK**: 31.5, n = 45
- **YUK**: 31.5, n = 13
- **NWT**: 32.2, n = 1
- **BC**: 33.1, n = 26
- **AB**: 33, n = 5
Bare tarsus measurements for *calurus* by Province & State with sample sizes

Not clinal with latitude

Little difference between sexes

All taken from breeding season specimens or live hawks in summer

<table>
<thead>
<tr>
<th>Region</th>
<th>Average</th>
<th>Sample Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>BC</td>
<td>39.7</td>
<td>35</td>
</tr>
<tr>
<td>WA</td>
<td>39</td>
<td>15</td>
</tr>
<tr>
<td>OR</td>
<td>40</td>
<td>4</td>
</tr>
<tr>
<td>ID</td>
<td>38.8</td>
<td>4</td>
</tr>
<tr>
<td>MT</td>
<td>40.7</td>
<td>6</td>
</tr>
<tr>
<td>WY</td>
<td>39.2</td>
<td>3</td>
</tr>
<tr>
<td>CA</td>
<td>41.8</td>
<td>76</td>
</tr>
<tr>
<td>NV</td>
<td>40.6</td>
<td>8</td>
</tr>
<tr>
<td>UT</td>
<td>43.3</td>
<td>15</td>
</tr>
<tr>
<td>CO</td>
<td>41.3</td>
<td>12</td>
</tr>
<tr>
<td>AZ</td>
<td>43</td>
<td>16</td>
</tr>
<tr>
<td>NM</td>
<td>40.9</td>
<td>17</td>
</tr>
<tr>
<td>BAJA</td>
<td>43.7</td>
<td>6</td>
</tr>
</tbody>
</table>
Summary: Harlan’s Hawk differs from Red-tailed Hawk, *Buteo jamaicensis calurus*, by:

1. Frequency of color morphs;
2. Adult plumage by color morph especially in tail pattern and color;
3. Harlan’s adult & juvenile plumages are almost alike; whereas those of Red-tails differ.
4. Extent of bare area on the tarsus.
Plumage differences between *harlani* and *jamaicensis* are > between subspecies of any other raptor
Future work

More field work in western Canada and Alaska during the breeding season is needed to get a clearer understanding of the *harlani* breeding there and their relationship to Red-tailed Hawks.

DNA researchers should sample these taxa across western Canada & Alaska and then use advanced techniques to locate the genes that are causing differences in phenology and sequence and compare those areas and relate phenotypes and genotypes to get a clearer understanding of the taxonomic status of Harlan’s Hawk.
LITERATURE CITED (continued):

Thanks

The following made helpful comments on drafts of this presentation:

Sue Heath prepared the Excel graph of bare tarsus measurements.

Thanks also to many photographers, especially Buzz Hull, Rick Morse, Kay Neumann, & Kevin Smith; many raptor banders; & some raptor rehabilitators for sharing photos & information.
Thanks

I thank with great enthusiasm the many curators and collection managers for permission to look at and study their bird specimens and for their freely given help.

Theirs is a most valuable and important resource for bird study.

A list of the museum collections sampled is on the next slide.
Academy of Natural Sciences, Philadelphia; Arkansas State U; Bell Museum (U of Minn); Boise State U; Burke Museum (U of WA); California Academy of Science; California State U Long Beach; Canadian Museum of Nature; Carnegie Museum of Natural History; Conner Museum (WA State U); Cowan Vertebrate Collection (U of BC); Delaware Museum of Natural History; Denver Museum of Nature & Science; Douglas Co. OR Natural History Museum; Field Museum; Golden Gate Raptor Observatory; Heard Natural History Museum; LSU Museum of Natural Science: Ornithology; Michigan State U; Milwaukee Public Museum; Monte L. Bean Museum (BYU); Museum of Comp. Zoology (Harvard); Museum of Natural History (U of Iowa); Museum of Southwestern Biology (U of NM); Museum of Vertebrate Zoology (U of CA); Museum of Wildlife & Fish Biology (UC Davis); Museum of Zoology (U of Mich); National Fish & Wildlife Forensics Lab; Natural History Museum of LA County; Nebraska State Museum; North Carolina State Museum; North Dakota State U; Oklahoma State U; Philip L. Wright Zoological Museum (U of MT); Sam Noble OK Museum of Natural History; The Peregrine Fund; Royal Alberta Museum; Royal British Columbia Museum; Royal Ontario Museum; Royal Saskatchewan Museum; San Diego Natural History Museum; Slater Museum (U of Puget Sound); WFSD collection, Texas A & M; UCLA – Dickey Bird and Mammal Collections; U of AK Museum; U of AB; U of AZ; U of CO Museum of Natural History; U of Kansas Natural History Museum; U of MO; U of Victoria; U. of Wis.; U. S. National Museum; Utah Museum of Natural History; and Western Foundation of Vertebrate Zoology.
THANKS FOR YOUR ATTENTION

Thanks also to The Peregrine Fund (especially Lloyd Kiff & Travis Rosenberry) for making this presentation available on their Global Raptor Information Network (GRIN) web site.

Washington